

WHAT IS CLAIMED IS:

1. A plasma processing apparatus comprising:
- an antenna for generating an electric field in a plasma generating portion;
  - a radio-frequency power source for supplying radio-frequency electric power to said antenna;
  - a vacuum chamber enclosing the plasma generating portion to establish a vacuum therein;
  - a Faraday shield provided around said plasma generating portion;
  - a gas supply unit for supplying gas into said vacuum chamber;
  - a sample stage on which an object to be processed is placed; and
  - a radio-frequency power source for applying a radio-frequency electric field to said sample stage,
- such that a plasma is generated by accelerating electrons and ionizing the gas by collision with the electric field generated by said antenna, so as to process said object,
- wherein the vacuum chamber has an upper face and a lower face, and wherein the upper face of said vacuum chamber has a smaller area than that of the lower face, and the upper face is flat, and
- wherein a plate made of a conductor or a semiconductor is placed on an inner side of the upper face of the vacuum chamber.

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2. A plasma processing apparatus according to Claim 1, wherein a radio-frequency power source is applied to said plate so as to apply radio-frequency waves to said plate.

3. A plasma processing apparatus according to Claim 1, wherein a DC voltage source is applied to said plate so as to supply DC voltage to said plate.

4. A plasma processing apparatus according to Claim 1, wherein said plate is grounded.

5. A plasma processing apparatus comprising:  
an antenna for generating an electric field in a plasma generating portion;  
a radio-frequency power source for supplying radio-frequency electric power to said antenna;  
a vacuum chamber enclosing the plasma generating portion to establish a vacuum therein;  
a Faraday shield provided around said plasma generating portion;  
a gas supply unit for supplying gas into said vacuum chamber;  
a sample stage on which an object to be processed is placed; and  
a radio-frequency power source for applying a radio-frequency electric field to said sample stage,  
such that a plasma is generated by accelerating

electrons and ionizing the gas by collision with the electric field generated by said antenna, so as to process said object,

wherein the vacuum chamber has an upper face and a lower face, the upper face of said vacuum chamber having a smaller area than that of the lower face, and the upper face is flat, and

wherein the vacuum chamber has first and second portions between the upper and lower faces, the first portion having a smaller cross-sectional width in a direction between the upper and lower faces than the second portion, and wherein said antenna is disposed outside said first portion.

6. A plasma processing apparatus according to Claim 5, wherein a plate made of a conductor or a semiconductor is placed on an inner side of the upper face of the vacuum chamber.

7. A plasma processing apparatus according to Claim 6, wherein a radio-frequency power source is applied to said plate so as to apply radio-frequency waves to said plate.

8. A plasma processing apparatus according to Claim 6, wherein a DC voltage source is applied to said plate so as to supply DC voltage to said plate.

9. A plasma processing apparatus according to Claim 6, wherein said plate is grounded.

10. A plasma processing apparatus according to claim 5, wherein the first portion of the vacuum chamber is between the upper face of the vacuum chamber and the second portion of the vacuum chamber, and the second portion of the vacuum chamber is between the lower face of the vacuum chamber and the first portion of the vacuum chamber.

11. A plasma processing apparatus according to claim 5, wherein the first portion of the vacuum chamber is adjacent said upper face of the vacuum chamber, and said second portion is adjacent the lower face of the vacuum chamber.

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